(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 357 276 A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 89308179.4

(51) Int. Cl.5: B65D 51/20 , B65D 81/20

(22) Date of filing: 11.08.89

(30) Priority: 02.09.88 US 240028
02.09.88 US 240034

(43) Date of publication of application:
07.03.90 Bulletin 90/10

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI NL SE

(71) Applicant: GENERAL FOODS CORPORATION
250 North Street
White Plains, N.Y. 10625(US)

(72) Inventor: Nugent, Frank
64, Marshall Road
Ridgefield Connecticut 06877(US)

(74) Representative: BATCHELLOR, KIRK & EYLES
2 Pear Tree Court Farringdon Road
London EC1R 0DS(GB)

(54) Vacuum packed canned product and method using foil membrane end closure.

(57) A vacuum packed can, and a method of packaging same, especially for dry, granular products (16) such as coffee, having an easy opening foil membrane (14) adhered to one end of the can, preferably along a circumferential band (13), having a width greater than 2.5 mm, preferably 3.4 mm. The foil membrane (14) is preferably of a thickness of 80 - 120 microns, preferably 100 microns, and is preferably adhered to the end of the can by a hot melt PVC.

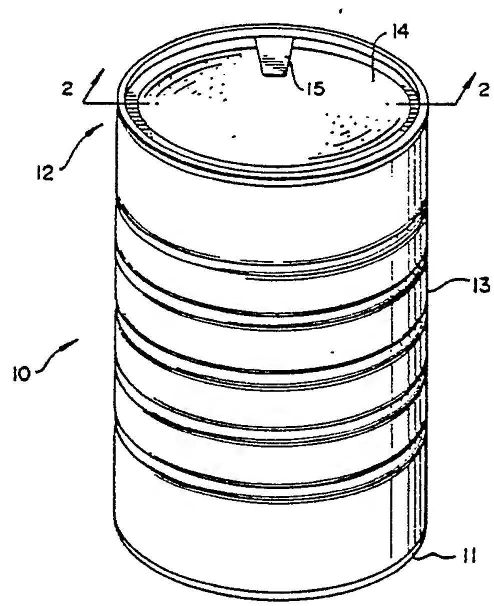


FIG. I

EP 0 357 276 A1

VACUUM PACKED CANNED PRODUCT AND METHOD USING FOIL MEMBRANE END CLOSURE

TECHNICAL FIELD

This invention relates to a vacuum packed canned product, especially for foods, having an easy opening foil membrane closure, and a method of forming such a package.

BACKGROUND OF THE INVENTION

A number of products, and particularly food products in granular form, are packaged in cylindrical cans wherein one of the can ends is readily opened by peeling back a thin foil membrane which is adhered to that end. Such membranes comprise a flexible foil/plastic composite structure adapted to define a closure member which is heat sealed to a tin plated steel or an aluminum can end. Such a closure is described in two publications. First, Aluminum-Walzwerke Singen Gmbh, Alusingen-Platz 1, D-7700 Singen/Hohentwiel, Federal Republic of Germany, in their April 4, 1987 edition entitled ALUFIX -Laminate Stock for Easy Opening Can Ends. Second, a February 6, 1988 article entitled "Specialty Stamps Out Sharp Edges with its New End".

Such laminated foil membranes are capable of numerous combinations in end constructions employing Surlyn or heat-sealing lacquers used as heat-sealing coatings. Polyamides used as heat-sealing coatings are similarly employable for retortable products, as set forth in the above-noted Alusingen publication. Such closures have come to be known as Rychiger type closures.

Membrane end closures are also described in the Hardt U.S. Patent No. 4,328,905, issued May 11, 1982, and the Markert U.S. Patent No. 4,098,404, issued July 4, 1978.

However, while such easy opening foil membrane end closures have been known heretofore, the state-of-the-art until now has not provided a solution for successfully and reliably vacuum packaging a dry, granular product such as coffee. Coffee, especially roasted and ground coffee, is necessarily packaged under a substantially full vacuum of approximately 29 inches of Hg, and more generally speaking, at least 20 inches of Hg. Only an extremely tight closure can withstand such rigorous conditions. The need for such a tight closure is compounded by the fact that products of this type, especially canned coffee, are subjected to abusive physical conditions in the final stages of the manufacturing process, after the can has been completely closed, in shipping and handling in commerce, and over a relatively long storage time (often up to a year) until the can is ultimately opened by the consumer. Notwithstanding these rigorous conditions, and especially in view of the long shelf life of such a product, even a small, essentially unperceivable microscopic leak will in time destroy the vacuum and render the product useless. And yet, in order to be commercially successful, the reliability of such a seal would have to be so great that the percentage of leaking cans would be extremely low, probably far below 1/2 of 1 percent of all cans produced and sold.

In contrast to these extremely rigorous conditions, the entire concept of an easy opening container is to provide a closure which can be easily opened under simple manual force by a consumer of average strength. Thus, the entire concept associated with an easy opening, peelable foil membrane closure is essentially at cross purposes with the rigorous requirements for the vacuum packaging of a dry, granular product such as coffee or the like.

The vacuum packaging of coffee in a can presents additional problems. A can containing roasted and ground coffee must necessarily have a relatively wide opening. Consequently, a full vacuum will necessarily pull the foil membrane into a downward concave shape. The larger the opening, the farther down the foil membrane will be pulled. To assure the airtight integrity of the seal, the upper boundary of the product cannot be so high that it would prevent the foil membrane from deforming downwardly into the can. However, if the product is routinely filled to a lower level which appears to be too far beneath the top of the can, the average consumer might well be dissatisfied because the can will appear to be less than full. This problem is not resolved by making the opening smaller. The average consumer demands that the opening be larger than a minimum size, generally sufficient for the consumer to place his or her hand down into the can.

To my knowledge, before the present invention there have been no successful commercial applications of easily peelable foil membrane closures for a vacuum packed food product such as coffee or the like. The Markert U.S. Patent No. 4,098,404 relates to a vacuum package, and casually mentions coffee as one of the products that can be packaged by the invention disclosed therein. However, this reference does not disclose the specific parameters which I believe are necessary for the successful packaging of a dry, granular product under vacuum conditions.

SUMMARY OF THE INVENTION

Thus, the purpose of the present invention is to provide a vacuum packaged dry, granular product having a reliable, easy opening, peelable foil membrane closure.

This purpose is achieved, in accordance with the present invention, by providing a canned product and a method of packaging same, wherein the container, generally a metallic can, has an upper end having the peelable foil membrane attached thereto such that the holding force between the foil membrane and the end of the can is sufficient to reliably maintain vacuum during abusive handling conditions, including packaging, shipping and long storage of the cans, while concurrently being removable with a peel force acceptable to a consumer of average strength.

In accordance with one aspect of the present invention, these desirable characteristics are achieved by providing the proper combination of the foil thickness, the adherence characteristics of the adhesive and the width of the annular band at which the foil membrane is adhered to the top of the can.

It would appear that the band width must be at a minimum of approximately 2.5 mm, but preferably over approximately 3.0 mm, and even more preferably approximately 3.4 mm. In contrast thereto prior foil membranes, which were used on small diameter, non-vacuum cans, had a band width of no more than 1.9 mm. In combination therewith, the foil membrane should preferably be relatively thick, preferably approximately 100 microns, but generally in the range of 80-100 microns, or possibly up to 120 microns. This compares to prior membranes of approximately 60 microns, used in prior non-vacuum applications. In combination therewith, the adhesive is preferably a hot melt PVC.

Foil membranes of the present type are generally provided with some type of embossing. Heretofore, the purpose of such embossing has been primarily to enhance the appearance of the foil membrane. However, when using foil membranes of this type in the context of the present invention, the embossing has the added advantage of forming undulations which resist the return of the foil membrane to its original shape, after being pulled concavely downwardly by the vacuum in the can, as the negative pressure in the can is gradually, slightly reduced over the shelf life of the product.

Notwithstanding the rigorous demands upon the airtight seal between the foil membrane and the end of the can, the foil membrane should be openable by a peel force acceptable to the average consumer. Generally, this would be between 4 and 10 pounds.

Roasted and ground coffee, like many products, is sold in different size containers. For example, a so-called one-pound can of coffee is generally sold in a 401 size can (having a diameter of 4 1/16 inches), a so-called two-pound can of coffee is generally sold in a 502 size can (5 2/16 inches in diameter) and a so-called three-pound can of coffee is generally sold in a 603 size can (6 3/16 inches in diameter). Although the diameters of these can sizes differ, it would be undesirable to provide larger size openings for the larger size cans since larger openings would cause the foil membrane to flex too far concavely downwardly into the can. However, if the size of the openings on the larger cans is kept the same size as on the smaller cans, these openings must still include at least one point relatively close to the edge of the can so that when the consumer pours the dry, granular product out of the can, there would be at least one point where the product could pour easily, unhindered by a large flange between the opening and the edge of the can. Accordingly, in accordance with another feature of the present invention, when the foil membrane is applied for use on the larger cans, for example, the 603 size cans, the opening, being much smaller than the outer diameter of the can, is made eccentric relative to the axis of the can such that at least one point thereof is relatively close to the edge of the can, i.e., preferably spaced therefrom by a distance substantially equal to the said band width.

The foil membrane itself is generally much thinner and much more flexible than the can end to which the foil membrane is attached. The foil membrane will generally include a portion which extends beyond the band and is folded back against the top of the foil membrane. This will provide a tab which can be easily grasped by the consumer and pulled back to peel back the foil membrane from the end of the can, thus exposing the opening therein.

BRIEF DESCRIPTION OF THE DRAWINGS

There follows a detailed description of preferred embodiments of the present inventions, to be read together with the accompanying drawings wherein:

Figure 1 is a perspective view of a vacuum packed canned product incorporating the present invention.

Figure 2 is a partial cross-sectional view, taken in the vertical plane through line 2-2 of Figure 1.

Figure 3 is a plan view of Figure 1.

Figure 4 is a partial enlarged cross-sectional

view, taken along line 4-4 of Figure 3.

Figure 5 is a xerographic view of the upper end of a can of the present invention before vacuum is applied thereto.

Figure 6 illustrates a portion of Figure 5.

Figures 7 and 8 are enlarged partial schematic cross-sectional views illustrating the embossed structure of the foil membrane before and after the application of vacuum thereto, respectively.

Figure 9 is a schematic plan view corresponding generally to Figure 3, but illustrating another embodiment of the present invention.

Figure 10 is a partial cross-sectional view taken along line 10-10 of Figure 9.

Figure 11 is a highly schematic view illustrating the packaging method of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, like elements are represented by like numerals throughout the separate views.

Figure 1 illustrates a preferred embodiment of the vacuum packed canned product of the present invention, namely a can of the type generally used for the vacuum packing of roasted and ground coffee. Such a container has a metallic, cylindrical wall portion 13, a bottom or lower end 11 and a top or upper end 12. In the illustrated embodiment, the bottom 11 is of conventional construction and forms no portion of the present invention. The top 12 is closed by a foil membrane 14 having a tab 15, made in accordance with the present invention as described more fully below. The can is completed with a snap-on, plastic attachable and removable cover which is shown in dotted lines in Figure 2 at 18, which would be used by the consumer to protect the product after removal of the foil membrane.

Coffee cans are generally of three sizes, including the so-called one-pound can, referred to as the 401 size and having a diameter of approximately 4 1/16 inches, the so-called two-pound can referred to as the 502 size and having a diameter of approximately 5 2/16 inches, and the so-called three-pound can, referred to as the 603 size, having a diameter of approximately 6 3/16 inches. For reasons to be discussed in greater detail below, the foil membrane 14 will generally be concentric with the axis of the can for the 401 and 502 size cans, as illustrated in Figure 1, but will be eccentric relative to the axis of the can for larger sizes such as the 603 size can, as shown in Figures 9 and 10.

Referring to Figures 2 through 4 as well as Figure 1, the can will contain a product 16, generally a dry, granular food product, and especially roasted and ground coffee. The top comprises a stiff, metal portion comprising a circumferential rim 20 and a shelf portion 21 which curls inwardly and downwardly to form the opening 22 in the top of the can for removal of the product 16. The foil membrane 14 is adhered to the shelf portion 21 throughout the width of band B by a sealant 25 (see Figure 4), the preferred thickness of this band of sealant extending for substantially completely about the circumference of the shelf portion 21, although its thickness is slightly reduced at the outer periphery in the area where the pull tab 15 is bent back. As is evident in Figure 2, because of the pull of the vacuum within the can, the foil membrane 14 is flexed concavely downwardly into the opening 22 to a maximum depth at 26. The can is filled with coffee 16 up to a level which will allow the foil membrane 14 to deform downwardly when the can reenters the atmosphere. If the can is grossly overfilled to a higher level which would hinder the downward deformation of the foil membrane, this would cause an unsightly deforming of the foil membrane and hinder proper sealing of the top 12 onto the top edge of the can at the circumferential rim 20.

As will be described in greater detail below, the material of the foil membrane 14 overlying the opening 22 preferably has an undulated shape which, after downward flexing of the foil membrane 14, is generally smooth, usually retaining only the small protrusions 31. While these protrusions would exist over the entire area which overlies the opening 22, only a portion thereof (only one quadrant thereof) is illustrated (See Figure 3). When the vacuum is drawn on the filled can, the embossments are stretched downwardly and smoothened to varying degrees. Closer to the edge portions of the foil membrane downward flexing will generally be less than in the central area of the foil membrane.

Figures 5 through 7 illustrate the nature of the top 12 before the vacuum is applied, which vacuum forces the foil membrane 14 into its downwardly concave shape. Before being applied to the can 13, the top 12 is in the form of a lid with the foil membrane already attached to the shelf portion of the piece which forms the shelf 21 and the circumferential rim 20. In a preferred arrangement, before the vacuum is applied, the undulations are in the form of depressions in the form of parallelograms, preferably squares, as illustrated in Figure 6 and at 32 in Figure 7. Within each parallelogram is a raised frustroconical portion 31. As noted above, upon the application of vacuum, the depressions 32 are stretched out to varying degrees. In the central area where the stretching is greatest, only the upper portions of the frustroconical portions 31

remain, as illustrated in Figure 8. These portions 31 are also illustrated in Figure 3.

An essential feature of the present invention is that the foil membrane 14 be adhered to the top 12, and in particular, to the shelf portion 21, with a sufficient force that the seal will maintain its airtight integrity, notwithstanding the extremely abusive conditions to which a product of this nature is subjected, while concurrently being removable with a peel force acceptable to a consumer of average strength. It is an important feature of the present invention to provide parameters which satisfy these conflicting purposes. These abusive conditions include, firstly, the application of a substantially full vacuum, on the order of 29 inches of Hg, although the vacuum may be in the range of 20 - 29 inches of Hg. In addition, the package is subject to both hot and cold conditions and is continually under stress. After the packaging process, the cans are further abused in shipment in commerce, to the ultimate customer's shelf. Additionally, a product of this nature should have a long shelf life, preferably more than six months, so that the airtight integrity of the seal must remain over that long shelf life. For a commercial product, an extremely high level of reliability, for example over 99.5%, should be achieved.

If a leak does occur, the results are far more serious than the simple discarding of the can. Leaks would tend to be of microscopic size, not visually observable. If the leak occurs after the product has been on the consumer's shelf, the consumer would not necessarily notice the same. However, if the can happened to be upside down, the loss of vacuum plus the weight of the coffee against the foil membrane would distort the foil membrane, giving it a relatively ugly appearance, as the inward flexing returned to some extent, wrinkling the foil membrane. But most importantly, whether the can was rightside up or upside down, the loss of vacuum would cause the product itself to become stale.

The application of a foil membrane to a container for roasted and ground coffee presents the significant additional complication of the relatively large size of the opening. The consumer will generally demand a large size opening for a coffee can so that the consumer can reach down into the can and otherwise conveniently remove the product. Also, the edge of opening must be relatively close to the rim so that the consumer can easily pour product out of the can without an unacceptably large volume of the food product being caught beneath the shelf.

However, the larger the opening, the more difficult it becomes to provide an acceptable foil membrane closure for a container of this type. As illustrated in Figure 2, the pressure differential across the foil membrane 14 forces it downwardly beneath the level of opening 22. The larger this opening, the farther the foil membrane 14 will move downwardly. If it is permitted to move down too far, this could simply rupture the foil. Even if the foil membrane is not ruptured, it could be pulled downwardly so far that the product will hinder its full downward flexing as discussed above, this would give the foil membrane an unsightly appearance, and hinder complete sealing of the can at circumferential rim 20. Since this would be unacceptable, the packager would have to redesign the container so that a greater space would be provided between the upper boundary of the product and the plane of shelf portion. However, if this occurred, th consumer, upon originally opening the product, would be dissatisfied because the larger space would give the impression that the container was not adequately filled.

Figures 9 and 10 illustrate another embodiment of the present invention which illustrates its application to a relatively large diameter can. As shown therein, the relatively large diameter can 40 includes a lid which comprises a circumferential rim 41 similar to the circumferential rim 20 of Figures 1 through 4 and an inner portion 42 which forms a shelf portion having an eccentrically located circular opening 43 covered by the foil membrane 14 which is attached to the shelf portion of lid. As noted above, for larger size cans, it becomes unacceptable to make the opening as large as the diameter of the can itself. Assuming thate the embodiment of Figures 9 and 10 is such a relatively large can, the opening 43 will be somewhat smaller than the diameter of the can 40, but in this embodiment, more than the radius of the can 40. However, for reasons discussed above, it is also necessary that at least a portion of the opening be relatively close to the edge of the can to facilitate pouring product out of the can without an unacceptable large volume of the product being caught beneath the shelf. It is for this reason that the opening 43 and its covering foil membrane 14 are positioned eccentrically on the can 40 relative to its vertical axis.

In the embodiment of Figures 1 through 4, it was noted that the foil membrane and the piece forming the shelf portion 21 and circumferential rim 20 are initially formed together as a single unit, as illustrated in Figure 5. The same principle would be applicable in the embodiment of Figures 9 and 10 except that in that embodiment the preformed piece having the foil membrane and the shelf and rim portion would be provided with the foil membrane 14 eccentrically located, i.e., essentially as shown in Figure 9, but with the same embossing 30 spread uniformly across the membrane 14 as shown in Figures 5 through 7, and subsequently

stretched after the application of the vacuum as also discussed above. In all other respects, the embodiment of Figures 9 and 10 is similar to the embodiment of Figures 1 through 4.

The provision of a reliable, airtight seal for the foil membrane 14 is further complicated by the need to permit its easy removal, i.e., removal by a force which is not too great for the average consumer. Using a Chatillon peel tester, the peeling strength could be in the range of from 4 to 10 pounds. Although the smaller the better for the consumer, and preferably between 5 and 8 pounds, it has been found to date that given the need for the high integrity seal, a peel strength can be achieved generally in the range of 5 to 10 pounds.

Achieving a reliable, high integrity, airtight seal for a vacuum packed container of the present type, and considering the limitations and demands of the size of the opening, the need for peel strength, etc., has been achieved by combining certain parameters.

An important parameter is the width of the band B. At a minimum, this band width should be more than 2.5 mm, but preferably over 3.0 mm. In a preferred embodiment, this band has a width of 3.4 mm. This band width cannot be increased indiscriminately because as its width increases, so too must one increase the width of the shelf portion. Specifically, in the embodiment of Figures 1 through 4, the entire shelf portion 21 would have to be enlarged, while in the embodiment of Figures 9 and 10, one would have to enlarge the shelf portion at least at the point where the foil membrane 14 is closest to the edge. Otherwise, as noted above, if this shelf portion becomes too wide, the consumer will find it inconvenient to pour product out of the container because too much product would hang up behind the shelf portion at the point of pouring.

Another important factor is a provision of a suitable sealant. It is necessary to use a sealant which firmly holds the foil membrane to the metal top. The preferred sealant which satisfies these conditions would comprise a polyvinyl chloride (PVC) heat sealable coating base, preferably applied as a layer to the underside of the foil membrane 14. Preferably the foil membrane would be an aluminum foil with a composition of approximately 98.3% aluminum, the sealant would be Alusuisse #410 at 12±2.4 gms/square meter.

Another significant parameter of the present invention is the thickness of the foil membrane. This membrane must be thick enough to withstand the abusive conditions referred to above, and also to retain its downwardly flexed shape even as the level of vacuum within the container is reduced over the shelf life of the product. For example, over a one-year shelf life the vacuum could be reduced, owing to carbon dioxide buildup, from its original level of between 20 and 29 inches of Hg to a lesser level of between 5 and 10 inches of Hg. If the foil membrane were not of sufficient strength, this reduction in the internal vacuum could push the foil membrane upwardly. Since the foil membrane could not possibly return to its original embossed, undulated shape, as discussed earlier with reference to Figures 5 and 6, the result would be a rather ugly wrinkling of the foil membrane 14, unacceptable to the consumer. It will be noted that the embossed, undulated shape and, in particular, the remnants thereof, including the remaining frustoconical portions 31, will also assist in preventing the foil membrane 14 from moving upwardly from its downwardly flexed shape upon reduction of vacuum in the can. However, the thickness of the foil membrane 14 nonetheless is a significant factor in reducing such upward movement of the foil membrane. The preferred thickness of the foil membrane, when made of the preferred material, 98.3% aluminum, is approximately 100 microns, although it is believed that the invention would be operable with a somewhat smaller thickness, possibly as low as 80 microns. At the upper limit, it is believed that the thickness could approach 120 microns.

However, increasing the foil thickness presents an additional problem in that it increases the difficulty of forming the seal between the foil membrane 14 and the shelf portion. To form such a seal, it is necessary to use dies which press against the exposed opposed surfaces of foil membrane 14 and the shelf portion and urge them together, driving heat through them to the sealant at the interface between them. The thicker the foil membrane, the more difficult it is to drive this heat therethrough, and hence the more difficult it will be to properly melt the sealant to form a reliable seal.

As will be apparent from the preceding discussion, the diameter of the foil membrane 14 should be fairly large, relative to the diameter of the can to which it is applied. Generally, at least for all but the larger cans, the foil membrane 14 should generally approach the diameter of the can and be concentric therewith. However, even for the larger cans, as illustrated in Figures 9 and 10, the diameter of foil membrane 14 should be greater than the radius of the can.

The tab 15, when gripped and pulled, will transfer the tearing stresses from the tab to a focused region of points, whereby a more reliable and effective action is afforded, so that the foil membrane 14 will separate from its sealed relationship to the shelf portion.

There has been described a specific preferred embodiment of the foil membrane including a certain composition, in which case the foil membrane would generally be of the thicknesses described,

i.e., 80 to 100 microns and preferably 100 microns. However, it is conceivable that the foil membrane can be varied in composition or shape in ways which would alter its stiffness such that the preferred thickness might be different than the range described above. For example, for a foil having a harder alloy, the thickness might be somewhat reduced. Also, for different shapes of the undulations 30 shown in Figures 5 and 6, the strength of the foil membrane might be changed, thus permitting a corresponding increase or decrease in the thickness of the foil membrane. The exterior of the foil membrane 14 will preferably be colored differently from the underside thereof, for example, gold-colored with a lacquer to thereby provide a contrast with the tab 15 which will be silver in appearance since the visible portion thereof will be an extension of the underside of the foil, bent back over the top thereof.

In a typical coffee container 10, the top of the can itself, i.e., the material which forms the shelf portion, the rim and the curled back opening, has a thickness of 0.0083 inches (i.e., 75 pounds per base box of tin-coated steel), the wall portion 13 being approximately 0.0083 inches. Hence, the foil membrane 14 will have a thickness which is substantially smaller (less than 1/2) of the said material forming the top. Additionally, the foil membrane 14 will, of course, be much more flexible than the material of the shelf portion so that when the vacuum is applied, it will flex downwardly far more than the shelf portion, if the latter flexes downwardly at all, as best illustrated in Figure 2.

The top 12, including elements 20, 21 and 22, or 40, 41, and 42, will preferably be composed of steel electroplated with tin and provided in the form of a metal ring, the rim portion 20 or 40 of which will be double-seamed to the end of cylindrical portion 13. A solvent-based compound, Viz, Midland Dexter, No. 2140 for double-seaming the end of can wall 13 may be used, although a water-based compound, e.g., Dewey and Almy, No. 480-T, may also be used.

The method of vacuum packaging the dried granular food product in accordance with the present invention will be described with reference to Figure 11. Initially, as shown as step A, a container 13 or 40 is supplied having a conventional bottom 11 The container is filled with product, e.g., roasted and ground coffee at step B. Then, at step C, a lid as shown in Figure 5 or a corresponding lid for the embodiment of Figures 9 and 10 is applied loosely to the container, now filled with product. At step D the lid is crimped onto the upper edge of the can at the circumferential rim. Crimping is the first stage of forming the double-seam seal, wherein the lid is bent down onto both the outer side and the inner side of the upper edge of the can, but only loosely, not yet airtight. This loose, non-airtight crimp will assure that the lid stays in place on the can in the vacuum chamber, while still allowing air to pass therethrough so a vacuum can be drawn within the can. The container then enters the vacuum chamber at E. In the vacuum chamber the vacuum is drawn to evacuate air from the can. Then, while the can is still in the vacuum chamber, the airtight double-seam seal of the lid to the upper edge of the can is completed as both the inner and outer sides of the circumferential rim are sealed tightly against the upper edge of the cylindrical portion of the can, completing the hermetic, airtight, double-seam seal. The product then passes out of the vacuum chamber at step F wherein the atmospheric pressure acting downwardly on the foil membrane 14, having the vacuum therebeneath, is moved concavely downwardly. Finally, as shown in step G, a conventional attachable and removable snap-on plastic cover 18 is applied to the can, this cover to be used by the consumer after the foil membrane 14 has been removed.

Although the invention has been described in considerable detail with respect to preferred embodiments, it will be apparent that the invention is capable of numerous modifications and variations, apparent to those skilled in the art, without departing from the skill and scope of the invention.

Claims

1. A canned product comprising:
a can having a cylindrical wall and opposed upper and lower ends,
the interior of the can containing a dry, granular product under vacuum and filled to a height spaced below said upper end,
said upper end having an outer circumferential rim and a horizontal shelf portion extending inwardly from the rim for a distance equal to at least 2.5 mm, substantially completely around the circumference of the can, the shelf being of a relatively stiff material,
a circular opening formed in said shelf and having a diameter greater than the radius of the can, which opening is adapted to discharge product therethrough,
and a removable foil membrane extending across and closing said opening, the foil membrane having a thickness which is substantially thinner than the thickness of the shelf and substantially more flexible than the shelf, said foil membrane horizontally overlapping the shelf and adhered thereto by a sealant along a band which completely encircles said opening and has a band width of not less than 2.5 mm for substantially its entire circumference,
the foil membrane being flexed at least slightly

concavely downwardly into the can under the force of the vacuum within the can to such a depth below the shelf portion that the downward flexing of the foil membrane is not hindered, the thickness of the foil membrane being sufficient to withstand the forces of the substantial vacuum within the canned product, withstand abusive of handling conditions and resist a return from its concave shape towards an unflexed shape as the vacuum within the can reduces over the shelf life of the product,
a portion of the foil membrane extending beyond the band width to form a pull tab,
the combination of the foil thickness, the adherence characteristics of the sealant and the band width forming a seal having a holding force sufficient to maintain vacuum during abusive handling conditions, including packaging, shipping and storing of cans, and concurrently being removable with a peel force of between 4 and 10 pounds.

2. A canned product according to claim 1, wherein the thickness of the foil membrane is between 80 and 120 microns.

3. A canned product according to claim 2, wherein the thickness of the foil membrane is approximately 100 microns.

4. A canned product according to claim 1, wherein the band width is greater than 3.0 mm.

5. A canned product according to claim 4, the band width being approximately 3.4 mm.

6. A canned product according to claim 1, the shelf opening being concentric with the axis of the can and forming a shelf width which is substantially equal to the band width.

7. A canned product according to claim 6, wherein the band width is greater than 3.0 mm.

8. A canned product according to claim 7, wherein the band width is approximately 3.4 mm.

9. A canned product according to claim 1, the shelf opening being eccentric relative to the axis of the can, the opening being spaced from the rim, at one point, by an amount substantially equal to the band width.

10. A canned product according to claim 9, wherein the band width is greater than 3.0 mm.

11. A canned product according to claim 10, the band width being approximately 3.4 mm.

12. A canned product according to claim 1, the adhesive being a hot melt PVC.

13. A canned product according to claim 1, the band width being greater than 3.0 mm, the sealant being a hot melt PVC, and the opening being concentric relative to the axis of the can, having a shelf substantially equal to the band width and the foil membrane having a thickness of between 80 and 120 microns.

14. A canned product according to claim 13, wherein the band width is approximately 3.4 mm and the foil membrane has a thickness of approximately 100 microns.

15. A canned product according to claim 1, the band width being greater than 3.0 mm, the sealant being a hot melt PVC, and the opening being eccentric and having a shelf which, at one point, is substantially equal to the width of the band and the foil membrane having a thickness of between 80 and 120 microns.

16. A canned product according to claim 15, wherein the band width is approximately 3.4 mm and the foil membrane has a thickness of approximately 100 microns.

17. A canned product according to claim 1, wherein the portion of the foil membrane inside of the band and overlying the opening is uniformly embossed.

18. A canned product according to claim 1, wherein the can has a vacuum of approximately 29 inches Hg, the band width is 3.4 mm, and the foil membrane has a thickness of approximately 100 microns.

19. A canned product according to claim 18, wherein the opening in the end of the can is concentric with the axis of the can.

20. A canned product according to claim 18, wherein the opening in the end of the can is eccentric relative to the axis of the can.

21. A canned product according to claim 1, including a removable and replaceable snap-on plastic cover member covering the upper end of the can.

22. A canned product according to Claim 1, wherein the foil membrane comprises a metallic foil and the sealant is a hot melt adhesive laminated to the underside of the metallic foil.

3. A canned product according to Claim 22, wherein the hot melt adhesive is polyvinyl chloride.

4. A canned product according to Claim 23, wherein the band width is approximately 3.4 mm and the metallic foil is an aluminum foil with a thickness of approximately 100 microns.

25. A method of packaging a dry, granular product under vacuum comprising the steps of:
taking a cylindrical can with a closed bottom and an upper cylindrical edge forming an open top and containing a predetermined amount of dry granular product therein,
while the can, with the dry granular product therein is under a substantial vacuum, sealing to the open top of the cylindrical can a lid structure having a circumferential rim, a shelf portion extending radially inwardly therefrom, a lid opening therethrough and a foil membrane extending across and covering the lid opening and adhered to the shelf portion along a circumferential band at least 2.5 mm in width and extending substantially completely around the opening, the foil membrane being of a thickness substantially thinner than that of the shelf

portion and substantially more flexible than the material of the shelf portion, the sealing including airtightly attaching the circumferential rim to the upper cylindrical edge,
removing the sealed can from the vacuum, wherein the atmospheric pressure exterior of the can will flex the foil membrane concavely downwardly into the can to such a depth below the shelf portion that the downward flexing of the foil membrane is not hindered by the dry, granular product which is vacuum packed therein,
the holding force of the foil membrane to the shelf portion being sufficient to withstand the forces of the substantial vacuum within the can product, withstand abusive of handling conditions and resist return from its concave shape towards an unflexed shape as the vacuum within the can reduces over the shelf life of the product.

26. A method according to claim 25, including, after sealing the lid to the can, attaching thereover a removable and replaceable snap-on cover member.

7. A method according to claim 25, wherein the vacuum is approximately 29 inches of Hg.

8. A method according to claim 27, wherein the band width is greater than 3.0 mm.

9. A method according to claim 28, wherein the band width is approximately 3.4 mm.

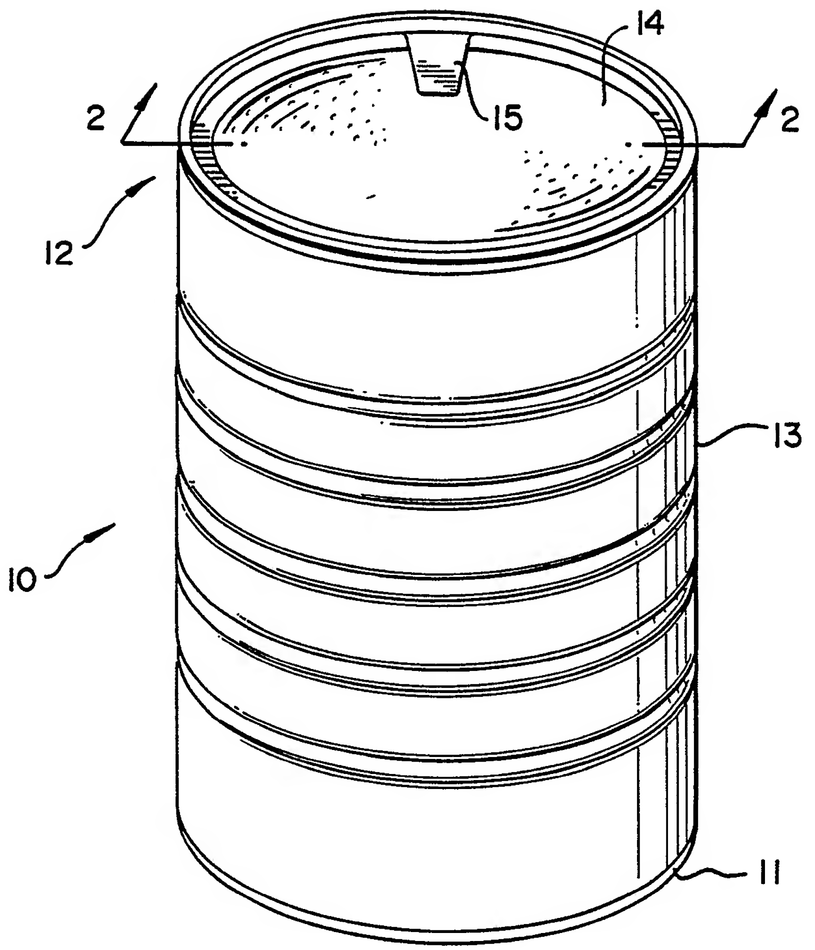


FIG. 1

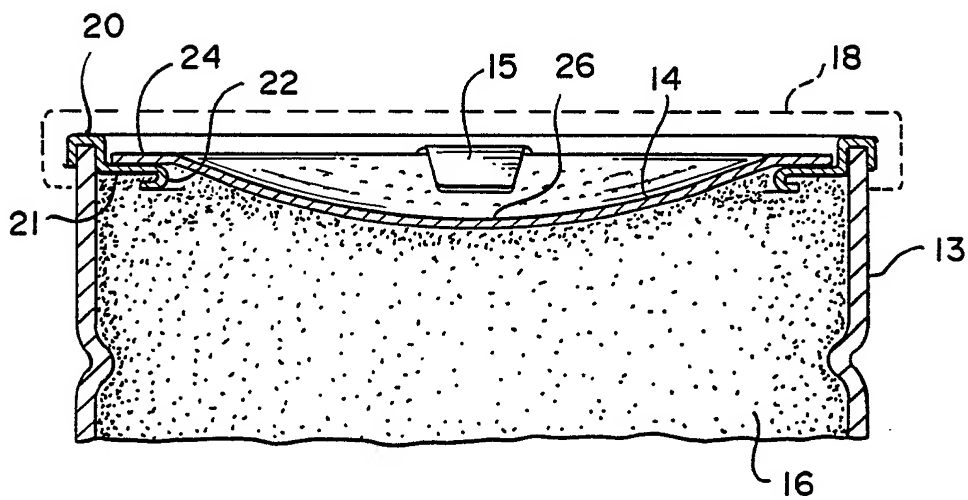
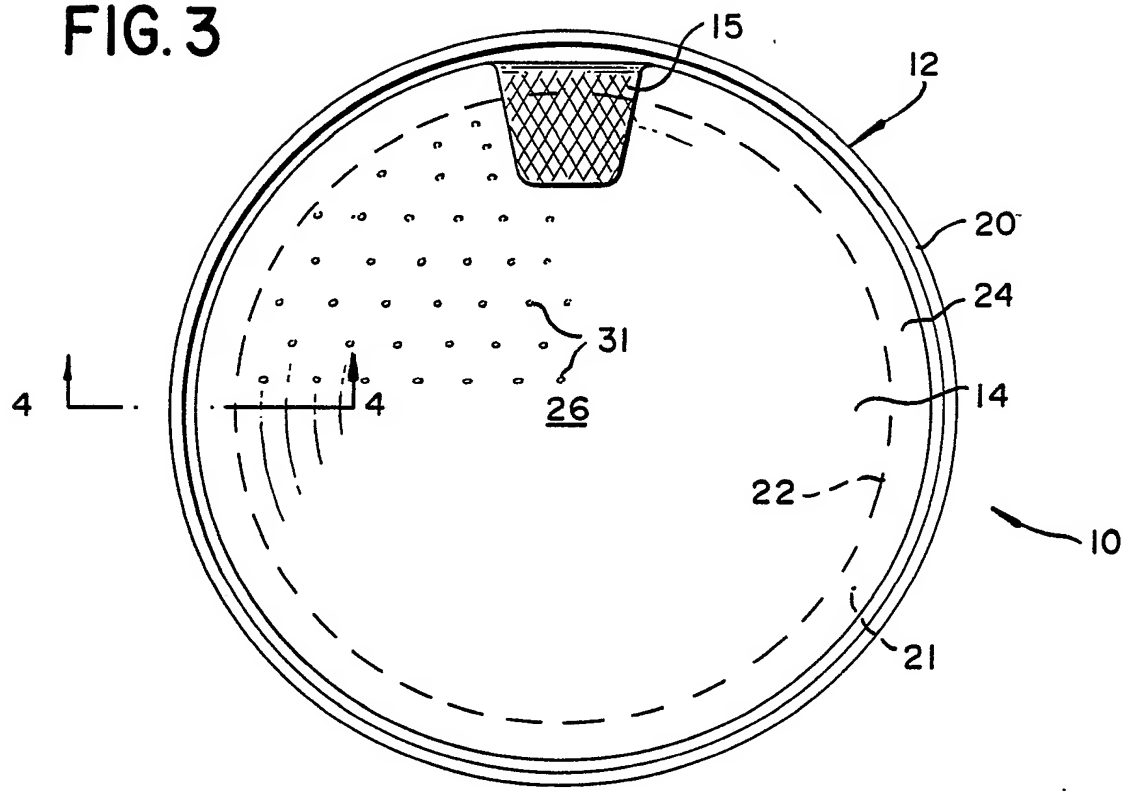


FIG. 2

Nouvellement déposé

FIG. 3



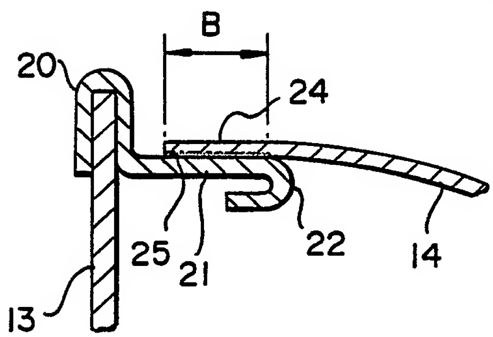


FIG. 4

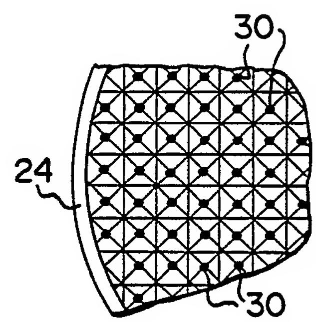
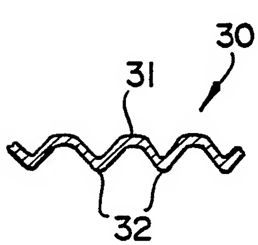


FIG. 6



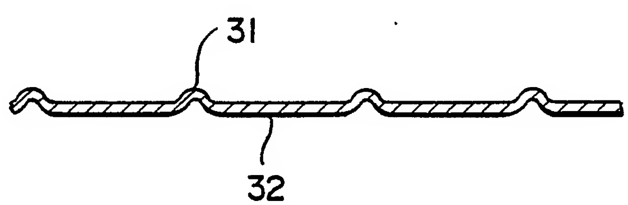


FIG. 7

FIG. 8

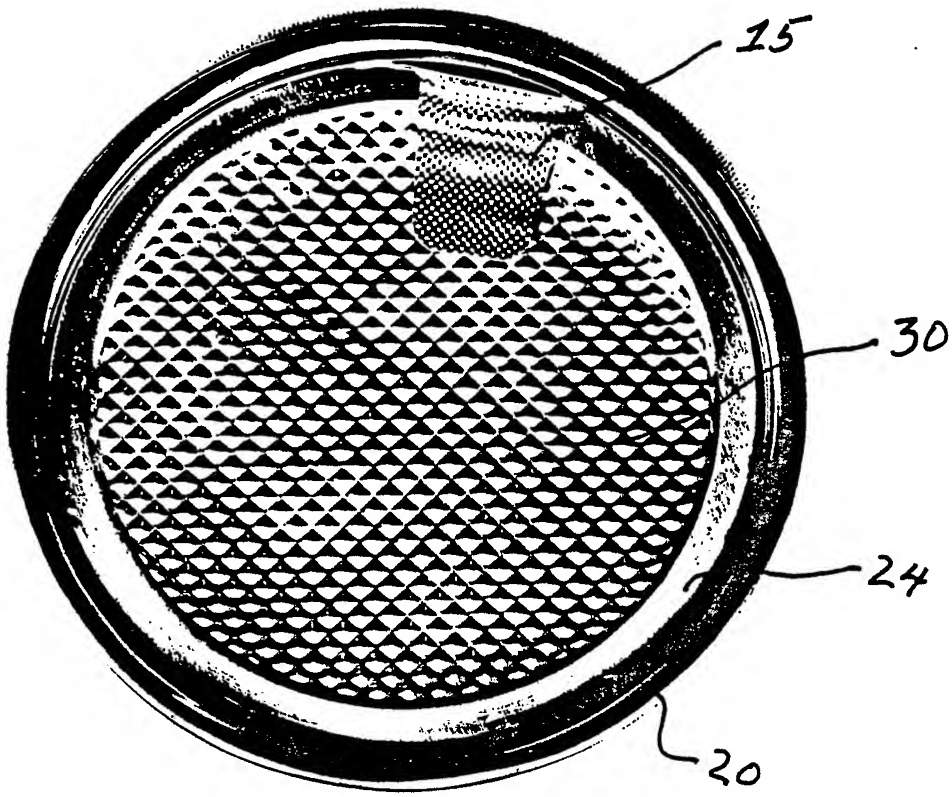


FIG.5

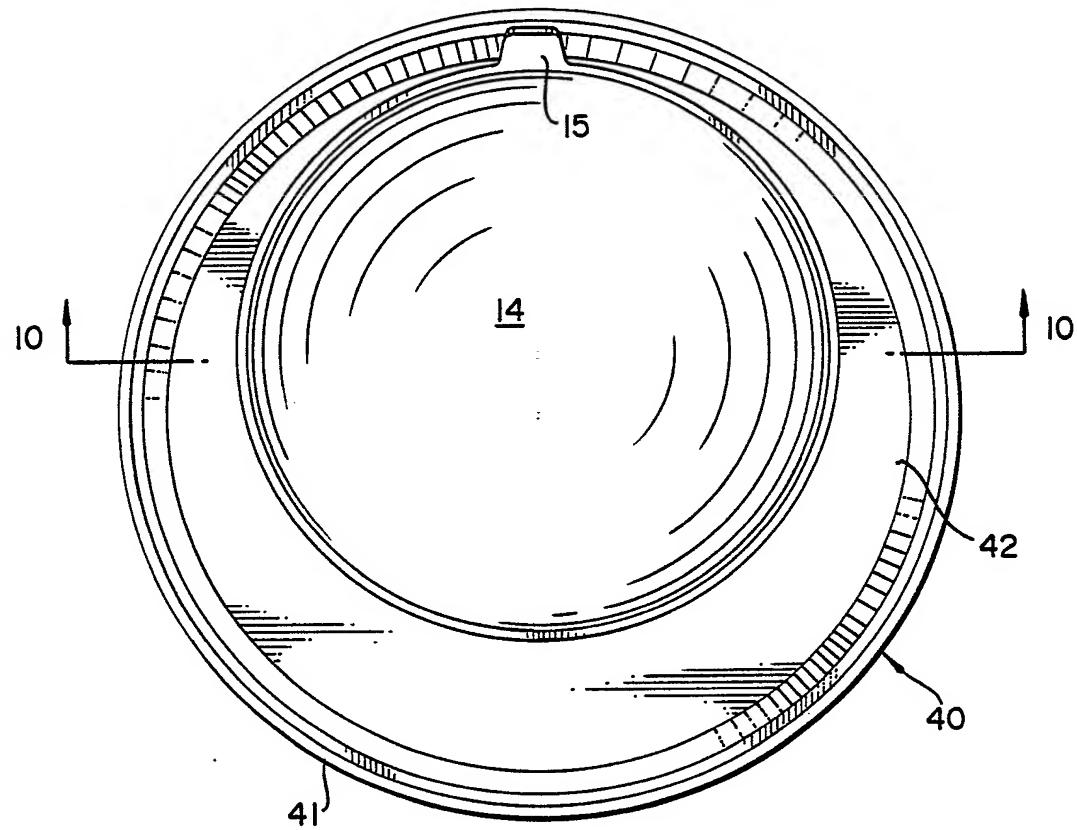


FIG. 9

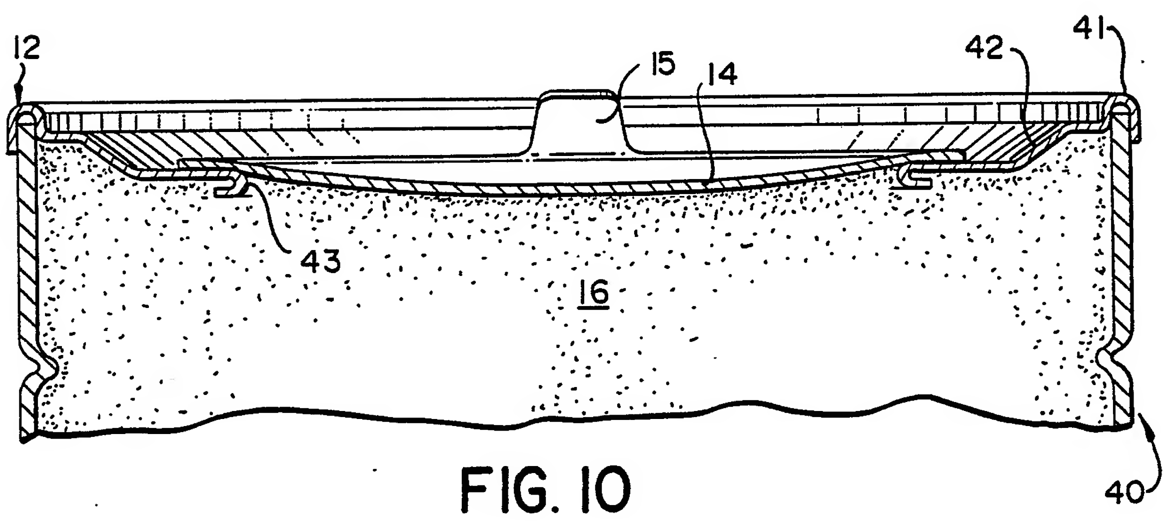


FIG. 10

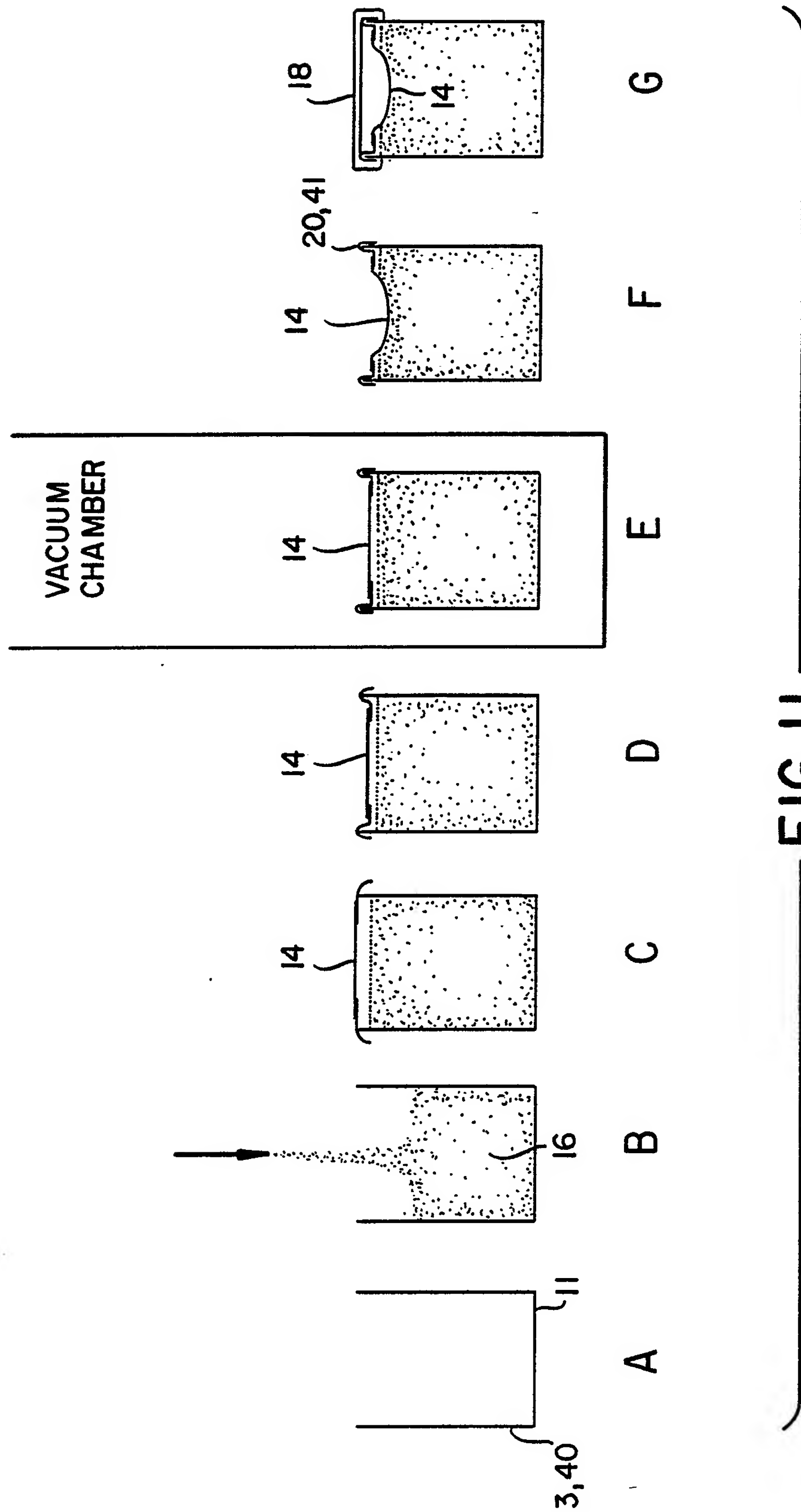


FIG. 11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 8179

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-3 157 308 (FOSTER) * Column 1, lines 53-72; column 3, lines 3-8; figures 1-9 * ---	1,25	B 65 D 51/20 B 65 D 81/20
A	FR-A-2 565 942 (SOFRATUBE) * Page 3, line 12 - page 4, line 15; figures 1,2 * ---	1,25	
A,D	US-A-4 098 404 (MARKERT) * Column 2, line 36 - column 3, line 24; figures 1-5 * -----	1,25	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10-11-1989	BESSY M.J.F.M.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document